MassGIS Data Viewer *Student Training*

Focus: Watersheds…….Ecological Address

State Perspective ***Lesson #1***

Introduction

Social Studies
Mathematics
Language Arts
Science

"Discovering Your Community's Watershed Basics – We Are All Connected"

Background: Watersheds are unique land and water systems that function together to collect precipitation from the atmosphere, to disperse that precipitation to groundwater and surface water systems, and to return the collected precipitation back to the atmosphere in the form of water vapor. Without watersheds, surface waters would dry up, wetlands would be destroyed, and the ability to obtain water from groundwater systems through wells would be impossible. All life depends on the continuous cycling of water that occurs through watersheds. Watersheds may be small or large depending on where the water is collected. Water enters the groundwater system within watersheds and is returned back to the atmosphere. In general watersheds are named after the flowing surface water body that is responsible for returning the water back to the atmosphere. These flowing water bodies are rivers. Watersheds are made up of many geological and physical features that enable them to function. These features are: recharge areas, where water enters the groundwater system; slopes that allow the water to enter the ground, or cause it to runoff surfaces; wetlands where water may move from groundwater systems to surface water systems; surface waters which may be flowing such as streams, brooks and rivers; and surface waters, including ponds and lakes.

In summary we can say that watersheds in New England are usually made up of: recharge areas, sloping land, wetlands, flowing surface waters bodies (brooks, streams and rivers), and still surface water bodies (ponds and lakes). Features such as wetlands connect the land systems with the water systems to complete the watershed structure. These individual geological and physical features function together to keep the water supply on earth flowing and recycling. Destruction of any of these features can have serious impacts on the rate of cycling, and the occurrence of cycling. Water supply quantity and quality may be seriously impacted when these physical features are altered, threatened or changed in any way.

It is important that every citizen understand his/her relationship to these watersheds. Understanding our relationship enables us to make decisions, and choices that will positively impact watersheds and thus the water cycle. The wrong decisions and choices

can cause destruction of the watershed and alter the water cycle functioning in our area. The possible negative consequences of poor decisions and choices could mean water shortages or water depletion, flooding, habitat degradation, lake and pond eutrofication or water pollution.

Watersheds are not only important for human beings, but for all living creatures. Watersheds through wetlands, streams and surface waters provide necessary habitat for a variety of wildlife (plants and animals). The overall health of the natural ecosystem is dependent on the continuous functioning of the water cycle through its relationship to watersheds.

Problem: An environmental organization called the Massachusetts Watershed Coalition (MWC), wants to begin a major education of Massachusetts citizens about the function of watersheds, their importance, and how they can become polluted or diminish the amount of available water. You have been asked to generate a "layout" showing the major watersheds in Massachusetts (Mega Basins). In addition you are asked to determine facts about each major watershed system using a data sheet, to show all citizens where Boston's water supply, the Quabbin Reservoir is located, and to make recommendations regarding a location in your area where a watershed education program could begin. In making your layout you must include the following information:

- The outlines of all mega basins
- The names of all mega basins in Massachusetts
- Identification of watershed basins that are considered Interstate
- Identify your community's major watershed
- Locate the Quabbin Reservoir

Your Task: Use the MassGIS Data Viewer to gather your information concerning the mega basins found in Massachusetts, the location of the Quabbin Reservoir, the Quabbin Reservoir's watersheds, and the watershed where your community is located. From your information and Viewer Observations, you are to answer basic questions concerning major watersheds, complete a Data Sheet based on your Viewer observations, print a layout map showing your information, and provide a chart that shows the sizes of the watersheds in relation to area and population.

Massachusetts Watershed Coalition Questions:

1. What are the names of the major watersheds found in Massachusetts?
2. List the watersheds that supply the Quabbin Reservoir.
3. Identify the watershed or watersheds that makes up your community.

Mass Data Viewer Skills:

- *Beginning the Viewer (Opening a Project)*
- *PC Basics (Minimizing and Maximizing Windows)*
- *Adding Themes to a View*
- *Window Bars (Menu, Button, Tool)*
- *Finding Theme Layers (A Button)*
- *Working with Themes (Visible, Active)*
- *Labeling Theme Features (Auto Label, Text Label)*
- *Working with the Menu Bar (Window, Graphics, Theme)*
- *Legend Editor (Label Column)*
- *Working with Tables (Records, Fields)*
- *Creating a Layout*

Viewer Buttons and Tools:

- *"A" Button*
- *Sort Ascending Button*
- *Sort Descending Button*
- *Identification Tool*
- *Auto Label Tool*
- *Text Label Tool*
- *Pointer Tool*

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Data Viewer Skills

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Creating a Major Watershed Layout for Massachusetts

1. Beginning the Viewer:

a. Go to the start button in the lower left window of your computer screen.

b. Holding the left mouse down, select "programs" and slide the mouse cursor over to the "MassGIS Runtime Data Viewer" and over again to the MassGIS Runtime Data Viewer. Release the mouse.

c. A window or several windows will appear on you screen.
MassGIS Runtime Data Viewer
Av30mg2.APR
MassGIS Data Viewer

2. Minimizing the Project Window

a. In using the MassGIS Runtime Data Viewer, it is critical that the "project" window is always left open on the desktop. The project window is labeled as "av30mg2.APR". Projects always end in ". apr".

b. At this time we will keep the project window open, but minimize it so we can enlarge the Data Viewer window. With the mouse, click on the av30mg2.APR title bar and it will turn blue.

c. With the mouse cursor find the three small boxes in the project window that are located in its upper right corner. Click in the dash box, and the project window will minimize to the bottom of the computer screen. The project is still open, but we have "minimized" its window. This will enable us to use the computer screen's window to work with the MassGIS Data Viewer window.

3. Maximizing the MassGIS Data Viewer Window

a. With the mouse pointer cursor, click on the title bar of the MassGIS Data Viewer window so it becomes blue or activated.

Hint: If it is already a bright blue and not gray you do not have to do this step.

b. With the mouse cursor, click on the middle box of three boxes in the MassGIS Data Viewer Title Bar. This will maximize the Viewer window so it fills the entire computer screen.

4. Adding Themes

a. In the Table of Contents (the gray column on the left), you should already see a small box checked with a title "MA Town Boundaries or MA Towns". This is a theme. Because the box is checked, we can see the outline of Massachusetts and all of the town boundaries. DO NOT do anything to this theme.

b. To add themes, we will use the "**A**" button located in the button menu bar at the top of your screen. The screen has three bars. The first is a word or menu bar, in the second row is the button bar and in the third row is the tool bar.

c. The button bar contains short cuts to the word/menu bar. The tool bar contains buttons that enable you to perform functions in the view window.

d. With your mouse cursor, click once on the "**A**" button. A new window opens on your screen, "Layer Categories". We will use the layer categories to select a theme to add to our view.

e. The themes have all been grouped into categories to make it easier for you to find them. Scroll down through the list and double click on the "Physical Resource" layer.

f. You will now see a window "Specific Layers". With the mouse, scroll down through the choices, click once on Watersheds and click OK or double click on "Watersheds".

g. A new window opens "Specific Layers". Now click on "Mega Basins" and click OK or double click on "Mega Basins".

Hint: Double clicking will either bring you to the next window or open the window without the need to click OK.

h. Notice that a new "theme" or "layer" has been added to your Table of Contents. The theme is checked and shows in your View. But we can no longer see the community boundaries.

i. The "Mega Basin" theme is layered on top of the "MA Town Boundaries" theme because it was added after the "MA Town Boundaries" theme. This rule is true for all themes except images, which always appear at the bottom.

5. Making the "MA Town Boundaries" Theme Visible

a. With your mouse, click once anywhere around the "MA Town Boundaries" theme (except the checkbox) in your View's Table of Contents.

b. When you clicked the theme, a long rectangular box appeared around all of the MA town Boundaries theme in the Table of Contents. When this happens we say the theme is "activated" or "active".

c. With the mouse cursor in the "MA Town Boundaries" activated area, hold down the left mouse button and drag the "MA Town Boundaries" theme to the top of the Table of Contents list so the "Mega Basins" theme is listed under the MA Town Boundaries theme in the Table of Contents.

d. Notice you can now see all of the community boundaries. Because the "MA Town Boundaries" is currently "transparent" we can see the "Mega Basins" theme underneath them.

6. Practicing Adding Themes

a. Using the "**A**" button, add the following themes. The layer category that contains the specific theme we will add has been listed to help you with this task.

Layer Category	**Specific Layer**	**Specific Layer**
Physical Resources	Hydrography (Water Features)	Lakes &Ponds...Major

7. Naming and Labeling the Major Watersheds

a. Make the "Mega Basin" theme active(again, by clicking its entry in the table of contents list). We can now work with the theme.

b. Go to the "Menu" bar and click on the word "Theme". A theme "drop down" menu appears. With the cursor select "Auto Label" and click once.

c. The "Auto-Label: Mega Basins" window appears. In the "label field" with the mouse cursor on the upside down triangle, click once. A "drop down" list of "fields" appears. Using the mouse to scroll, move the cursor down until "name" appears. Click once on the "Name" Field.

d. The "Label Field" now changes to "name". Be sure the "Find Best Label Placement" is chosen, "Remove Duplicates" is chosen, and "Scale Labels" is chosen. With the cursor, click OK.

e. Notice that all the Watershed Basins are labeled with their name. But we have some problems. It is difficult to see the basin labels. We will need to change the "text" characteristics in order to see the names.

8. Changing the Text Characteristics of Auto Label

a. Open the "Theme" menu and select "Remove labels" – click once. Notice all the basin names were removed from your view.

b. With the cursor, open the "Window" menu at the top of your screen. Select "Show Symbol Window".

c. When a "Fill Palette" window appears, click once on the ABC icon box.

d. Keep the default font. In the size window, keep 14 and select the style "bold" – click once.

e. Close the "Fill Palette" window by clicking its upper right "X" box.

f. Open the "Theme" menu and select "Auto Label". Be sure the "Label Field" remains "Name" and "Remove Duplicates" and "Scale Labels" are chosen. Click OK. The watershed labels should now be more visible in your View.

9. Finding Your Community and labeling It.

a. Be sure your mouse cursor is an arrow. If not, click on the "Pointer Tool" in the Tool Bar to return it to the arrow shape. With the mouse, make the "MA Town Boundaries" theme active.

b. Click on the "I" tool. Look at our map to see the "shape" that represents your town. Click once.

c. Continue to click in the town shapes until your community's name is listed next to the "Town" in the "Identify Results" window. Once you have found it, close the "Identify Results" window.

d. We will use the "Call Out Text" Tool to name your community in our View. Use the mouse pointer and select the "Window" Menu. Select "Show Symbol Window" and then click on the ABC Box.

e. In the "Font Palette" window, keep the font type Arial, the size 14, and the style Bold. Click once in "Create Markers". Close the "Font Palette" window.

f. Go to the "Text Label" Tool and select the "Call Out Text". Place the cursor over your community, and drag the mouse from our community to the white space beyond the Massachusetts state outline. Release the mouse.

g. In the "Text Properties" box, type in the name of our community – All Caps. Be sure the box for "scale to view" is checked. Click OK. Your community should be labeled in your View.

10. Finding the Quabbin and Labeling It in Your View

a. Change the mouse cursor back to a pointer. Make the "Maj Ponds" theme active.

b. Go to the "Theme" menu and select "Table" (or click on the table button). For every theme that is not an image, a "Table of Attributes" exists. The "Table" contains "fields" listed horizontally across the table, and "record" listed vertically.

c. In this case the Massachusetts Watershed Coalition has told you that the Quabbin Reservoir is assigned the Maj_pond-id as "793" in the MassGIS data. When you opened the "Attributes of Maj_Ponds", the menus changed at the top of your screen because you are now dealing with tables.

d. In the "Button Bar", find the button that is "Sort Ascending". Once you find this button, use your mouse pointer and click on the "Maj_pond-id" field in the table. This field should now appear as a dark gray, which means it, has been "highlighted".

e. Go to the "Button Bar" and click on the "Sort Ascending" button, which now appears darkened in the "Button" bar. The records in the "Attributes of Maj_Ponds" have now been listed in order of the "Maj_pond-id" field. Scroll through the table until you find the "maj_pond-id 793".

f. With the mouse pointer, click once on the row (record) where #793 is listed under the "maj_pond-id "field. The entire row (record) will become yellow. You have "selected" the Quabbin record.

g. Close the Table "Attributes of Maj_Ponds" and notice the "Quabbin Reservoir" polygon appears the same yellow as the selected Table record in your View.

h. Keep the Quabbin yellow and using the "Callout Label", label it the "Quabbin Reservoir".

i. With the "Maj_Pond" theme active, Open the Theme menu and select "Clear Selected Features" or click on the button that looks like a blank sheet of three ring paper. The Quabbin is no longer shown in yellow.

11. Adding Another Theme

a. Click on the "**A**" button. Select "Political Boundaries" Then "New England states", then "New England. Outline"

b. Make the "New England. Outline" theme active. We will use a different method of labeling. Go to the "Graphics" menu and select "Text and Label Defaults". In the second row of "Tool Icons" select by clicking, the "Text Label box" (no tail). Uncheck the box "Use Symbol Window Settings for Text".

c. Be sure Arial is selected. Make the color a medium red, the size 12, and the style bold. Uncheck "Use outline". Make the fill color transparent. Uncheck "Use drop shadow". Click OK

d. Go up to the "Tool Bar" and use your mouse to select the "label" pull down menu. Select the "Banner" label.

e. Move the cursor, which is now a cross with a label, over each state where you want its name to appear in your View. Click once and the name with appear. Do this for all the states.

f. Change the mouse cursor back to a pointer. If you want to move any of the state names, click once on the name. Move the cursor over the name, and holding the left mouse down, drag the name to where you want it placed. Move the cursor to outside the state and click once to get rid of the "handles" boxes around the state name. ***(1) List any Watershed Basins you believe are Interstate.*** (Data sheet)

12. Making a Layout

a. Go to the "View" menu and select "layout". In the "Map output" window, select 8.5 x 11. Click OK.

b. In the "Creating Map Using Current View" window, type "Mega Basins of Massachusetts". Click OK.

c. In the "Setting Page size and Margins", click NO

d. In the "Template Manager" window, select "Landscape" and click OK.

e. You now have your View, its Table of Contents and other symbols including a scale and a north symbol shown.

13. Printing Your Layout

a. Go to the "File" menu and select "Print Setup". Be sure you have the correct name of the printer. Be sure the paper size is 8.5 x 11 inches, and the orientation is landscape. Click OK.

b. In the print window, select OK.

14. Saving Your Layout as a "JPEG" File

a. Go to the "File" menu and select "Export". Pick the drive where you will export the Layout. We suggest c:\my documents.

b. In "List Files of Type", select JPEG.

c. In the "File Name Box", type "Layout#1". Click OK

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Data Sheet

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Name: _____ Date: _____

1. List any Watershed basins you believe are Interstate.

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MWC Question Sheet

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Name: _____ Date: _____

1. What are the names of the "Mega" watersheds found in Massachusetts?

2. List the watersheds that are responsible for supplying the Quabbin Reservoir with water.

3. Identify the watershed or watersheds where your community resides.

4. Complete the chart shown below:

Watershed Name	Area (Square Meters)	Area (Square Kilometers)	Population

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MWC Recommendation

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Name: _____ Date: _____

Using the MWC Criteria listed in the Problem, and your Layout Information, make a recommendation regarding a logical location where a watershed education program could be held in your area. Provide your reasons why you selected this location.